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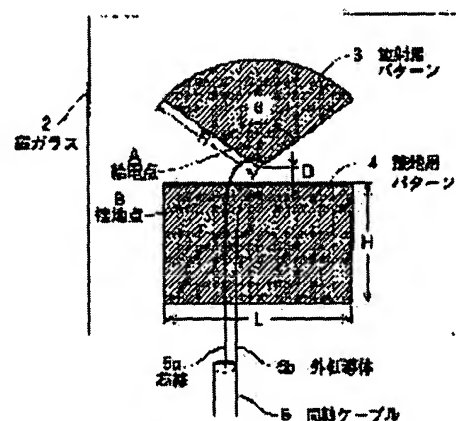
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(54) GLASS ANTENNA SYSTEM FOR MOBILE TELEPHONE SET

(57)Abstract:

PURPOSE: To provide a small sized glass antenna system for mobile telephone set with high sensitivity that receives a radio wave of two UHF bands in an excellent way.

CONSTITUTION: A perpendicular from a feeding point A is used for a symmetrical axis, and a projection being upwards having a prescribed angle $\theta/2$ around the symmetrical axis is formed with two line segments R with a prescribed length extended upward in the vicinity of the feeding point and with a line segment of an optional shape connecting tips of the two line segments. Then a planar radiation pattern 3 and a rectangular grounding pattern 4 having two sides H, L of prescribed lengths are formed symmetrically on a window pane 2 with respect to the symmetrical axis.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the glass antenna equipment for car telephones which is formed in the windowpane of an automobile, and transmits and receives in a UHF band, and relates to the glass antenna equipment for car telephones from which good sensitivity is obtained with one antenna in a frequency band (800MHz and 1.5GHz) especially.

[0002]

[Description of the Prior Art] As these people indicated in the real extraction-of-the-square-root No. 82113 [five to] official report, the pattern for radiation consists of monopole configurations, and, as for the conventional glass antenna equipment for car telephones, the pattern for grounding consists of rectangle-like conductor patterns.

[0003] The block diagram of the conventional glass antenna equipment for car telephones is shown in drawing 9 . In drawing 9 , the glass antenna equipment 50 for car telephones is formed on a windowpane 51 by the pattern 52 for radiation whose length of the vertical direction is about 1 / four waves, and the pattern 53 for grounding whose length of a longitudinal direction the length of the vertical direction is about 1 / 4 - 3/4 wave in about 1 / four waves. core-wire 54a of a coaxial cable 54 (characteristic impedance of 50ohms) connects with the feeding point A of the pattern 52 for radiation -- having -- the grounding point B of the pattern 53 for grounding -- the outside of a coaxial cable 54 -- a conductor -- 54b is connected Thus, as for the glass antenna equipment 50 for car telephones of a monopole configuration, transceiver frequency is used for the constituted pattern 52 for radiation as an antenna of the car telephone equipment of a 800MHz band.

[0004] Drawing 10 is the directional-characteristics view of the conventional glass antenna equipment for car telephones. In drawing 10 , directional characteristics with a frequency of 900MHz measured in the 800MHz band show an almost uniform value in all the directions, and a sensitivity difference is not seen.

[0005]

[Problem(s) to be Solved by the Invention] Although a 1.5GHz band is also increasingly used also for transceiver frequency along with the spread of car telephone equipment in addition to a 800MHz band, if the pattern for radiation applies the conventional glass antenna equipment for car telephones of a monopole configuration by the 1.5GHz frequency band, as shown in drawing 10 , on the frequency of 1.5GHz, dispersion will be in directional characteristics and sufficient sensitivity will not be obtained.

[0006] 1. In order to acquire good sensitivity directional characteristics by the frequency band of 5 GHz, the glass antenna equipment for car telephones of the monopole configuration for 1.5GHz bands is independently needed. When it is going to transmit or receive the electric wave of a frequency band (800MHz and 1.5GHz) good, 2 sets, the number of the coaxial cables which connect the number of glass antennas to a transmitter-receiver, and the same number, are needed. Thus, when it is going to form the with a monopole configuration [for frequency bands] (800MHz and 1.5GHz) glass antenna equipment for car telephones on the windowpane of an automobile, the technical problem to which a latus mounting space is required, and the miniaturization of an antenna cannot be attained, and manufacture becomes complicated occurs. Therefore, glass antenna equipment for car telephones which has sensitivity directional characteristics even with a good frequency band (800MHz and 1.5GHz) is desired.

[0007] It was made in order that this invention might solve such a technical problem, and the purpose is in offering the glass antenna equipment for car telephones which can receive the electric wave of two frequency bands, 800MHz and 1.5GHz, good.

[0008]

[Means for Solving the Problem] The glass antenna equipment for car telephones applied to this invention in order to solve the aforementioned technical problem Set a symmetry axis as the perpendicular which passes the feeding point,

and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, [0009] characterized by forming on a windowpane the pattern for grounding of the shape of a rectangle which has two sides of predetermined length. Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius, and is characterized by making the pattern for radiation into the shape of a sector. [0010] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration in a straight line, and is characterized by making the pattern for radiation into the shape of an isosceles triangle.

[0011] Furthermore, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the polygonal line, and is characterized by making the pattern for radiation into the shape of a polygon symmetrical with a symmetry axis.

[0012] Moreover, the glass antenna equipment for car telephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, and is characterized by forming the pattern for radiation.

[0013] Furthermore, the glass antenna equipment for car telephones concerning this invention is characterized by having the impedance adjustment means formed by the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding.

[0014]

[Function] The glass antenna equipment for car telephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, Since the pattern for grounding of the shape of a rectangle which has two sides of predetermined length was formed on the windowpane, the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good with one glass antenna equipment for car telephones.

[0015] Moreover, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius and made the pattern for radiation the shape of a sector, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0016] Moreover, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration in a straight line and made the pattern for radiation the shape of an isosceles triangle, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0017] Furthermore, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration by the polygonal line and made the pattern for radiation the shape of a polygon symmetrical with a symmetry axis, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0018] Moreover, the glass antenna equipment for car telephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, since it formed the pattern for radiation, is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0019] Furthermore, since the glass antenna equipment for car telephones concerning this invention was equipped with the impedance adjustment means formed by the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding, it can perform adjustment of the coaxial cable and impedance which are connected to the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding, can cover the whole frequency band, and can raise sensitivity.

[0020]

[Example] Hereafter, the example of this invention is explained based on an accompanying drawing. Drawing 1 is the block diagram of the glass antenna equipment for car telephones concerning this invention. In drawing 1, the glass antenna equipment 1 for car telephones forms the pattern 3 for radiation of the shape of a sector which has a predetermined radius R and a predetermined angle theta, and the pattern 4 for grounding of the shape of a rectangle which has two sides of predetermined length on a windowpane 2 in Distance D. moreover, the feeding point A of the pattern 3 for radiation -- core-wire 5a of a coaxial cable 5 (characteristic impedance of 50ohms) -- connecting -- the

grounding point B of the pattern 4 for grounding -- the outside of a coaxial cable 5 -- a conductor -- 5b is connected [0021] With the radius R of the sector-like pattern 3 for radiation, and the value of an angle theta, the impedance and frequency band of glass antenna equipment are set up. When setting the impedance of a glass antenna as 50 ohms of abbreviation, the value of R and theta has the following desirable range ($30\text{ mm} < R < 60\text{ mm}$, $80\text{ degrees} < \theta < 140\text{ degrees}$). Moreover, the distance D value of the pattern 3 for radiation and the pattern 4 for grounding has the following desirable range ($2\text{ mm} < D < 10\text{ mm}$).

[0022] Many properties of explaining below the radius R of the sector-like pattern 3 for radiation 45mm, Length H of the vertical direction of the pattern 4 for grounding of the shape of 120 degrees and a rectangle for an angle theta 40mm, The distance D of 60mm, the pattern 3 for radiation, and the pattern 4 for grounding for length L of a longitudinal direction 5mm, The length of a coaxial cable 5 (characteristic impedance of 50ohms) was set as 2m, and the glass antenna equipment 1 for car telephones installed and measured with the degree of tilt angle of 30 degrees on the copper plate arranged horizontally supposing being prepared in windowpane top 2 toward which the front face of an automobile or the tooth back inclined.

[0023] Drawing 2 is the directional-characteristics view of the glass antenna equipment for car telephones concerning this invention. the property at the time of measuring by 900MHz and 1.5GHz in drawing 2 -- it is -- both frequency -- an omnidirectional simultaneously -- a uniform value is shown and good directional characteristics are acquired

[0024] Drawing 3 is a sensitivity frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 3, as compared with the conventional glass antenna equipment for car telephones, the glass antenna equipment for car telephones of this invention is level which is convenient practically, although average sensitivity is falling slightly by the whole frequency band.

[0025] Drawing 4 is a sensitivity frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 4, the glass antenna equipment for car telephones of this invention is level as compared with the conventional glass antenna equipment for car telephones, cover the whole frequency band, high average sensitivity and almost equivalent to the average sensitivity of the 800MHz band shown in drawing 3.

[0026] Drawing 5 is a voltage standing wave ratio frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention. A voltage standing wave ratio shows that adjustment of the impedance of an antenna and a coaxial cable can be taken, so that the value is small. In drawing 5, as compared with the conventional glass antenna equipment for car telephones, the glass antenna equipment for car telephones of this invention covers the whole frequency band, and shows an almost equivalent value.

[0027] Drawing 6 is a voltage standing wave ratio frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 6, the glass antenna equipment for car telephones of this invention has a small numeric value, and has taken adjustment of the impedance of an antenna and a coaxial cable.

[0028] Drawing 7 is another example block diagram of the glass antenna equipment for car telephones concerning this invention. In drawing 7, a point equipped with the impedance adjustment means 7 which formed the glass antenna equipment 6 for car telephones by the conductor pattern near the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for grounding differs from the glass antenna equipment for car telephones of drawing 1. By having the impedance adjustment means 7, adjustment of an impedance with the coaxial cable 5 connected to the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for grounding can be taken, the whole frequency band can be covered, and sensitivity can be raised.

[0029] Drawing 8 is another example block diagram at the pan of the glass antenna equipment for car telephones concerning this invention. As shown in drawing 8 (a), the glass antenna equipment 8 for car telephones may consist of isosceles triangle-like a pattern 9 for radiation, and rectangle-like a pattern 4 for grounding. Moreover, as shown in drawing 8 (b), the glass antenna equipment 10 for car telephones may constitute the pattern 11 for radiation which made the splay extraction, and the rectangle section from a pattern for grounding made into extraction.

[0030] In addition, the pattern for radiation may make 120 degrees the angle theta of the pattern 3 for radiation of the shape of a sector shown in drawing 1, and may form it in the shape of a rhombus by one on the arc of the two sides and sector of a radius R.

[0031]

[Effect of the Invention] As explained above, the glass antenna equipment for car telephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, The pattern for

grounding of the shape of a rectangle which has two sides of predetermined length is formed on a windowpane. with one glass antenna equipment for car telephones Since the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good, the mounting space efficiency of an antenna becomes good and a miniaturization can be attained.

[0032] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius, makes the pattern for radiation the shape of a sector, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0033] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration in a straight line, makes the pattern for radiation the shape of an isosceles triangle, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0034] Furthermore, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the polygonal line, makes the pattern for radiation the shape of a polygon symmetrical with a symmetry axis, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0035] Moreover, it is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, the glass antenna equipment for car telephones concerning this invention forms the pattern for radiation, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0036] Moreover, since the glass antenna equipment for car telephones concerning this invention is adjusted with the feeding point of the pattern for radiation, and the coaxial cable which was equipped with the impedance adjustment means formed by the conductor pattern near the grounding point of the pattern for grounding, and was connected to the feeding point and the grounding point, it can cover the whole frequency band and can realize high sensitivity.

[0037] Therefore, the glass antenna equipment for car telephones of high sensitivity can be offered by small [which receives the electric wave of two frequency bands, 800MHz and 1.5GHz, good].

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CLAIMS

[Claim(s)]

[Claim 1] Glass antenna equipment for car telephones which is characterized by providing the following and which used and formed the conductor pattern in the windowpane of an automobile. A symmetry axis is set as the perpendicular which passes the feeding point, it has this symmetry axis and a predetermined angle, heights are formed up by the segment of the arbitrary configuration which connects between [of two segments of the predetermined length prolonged in the upper part near / aforementioned / the feeding point, and these two segments] points, and it is the pattern for radiation of a flat-surface configuration symmetrical with the aforementioned symmetry axis. Two sides of predetermined length.

[Claim 2] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration by the arc which makes the segment of the aforementioned predetermined length a radius, and making the aforementioned pattern for radiation into the shape of a sector.

[Claim 3] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration in a straight line, and making the aforementioned pattern for radiation into the shape of an isosceles triangle.

[Claim 4] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration by the polygonal line, and making the aforementioned pattern for radiation into the shape of a polygon symmetrical with the aforementioned symmetry axis.

[Claim 5] The claim 2 characterized by forming the aforementioned pattern for radiation by the pattern of the outside which extracted inside for the shape of the shape of an aforementioned sector, and an isosceles triangle, and each multiple configuration by the analog of itself, a claim 3, and glass antenna equipment for car telephones according to claim 4.

[Claim 6] The claim 1 characterized by having the impedance adjustment means formed by the conductor pattern the feeding point of the aforementioned pattern for radiation, and near the grounding point of the aforementioned pattern for grounding, a claim 2, a claim 3, a claim 4, and glass antenna equipment for car telephones according to claim 5.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram of the glass antenna equipment for car telephones concerning this invention

[Drawing 2] The directional-characteristics view of the glass antenna equipment for car telephones concerning this invention

[Drawing 3] The sensitivity frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 4] The sensitivity frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 5] The voltage standing wave ratio frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 6] The voltage standing wave ratio frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 7] Another example block diagram of the glass antenna equipment for car telephones concerning this invention

[Drawing 8] The glass antenna equipment for car telephones concerning this invention is another example block diagram further.

[Drawing 9] The block diagram of the conventional glass antenna equipment for car telephones

[Drawing 10] The directional-characteristics view of the conventional glass antenna equipment for car telephones

[Description of Notations]

1, 6, 8, 10 [-- An impedance adjustment means, 4, 12, 53 / -- 5 The pattern for grounding 54 / -- 2 A coaxial cable 51 / -- A windowpane, 50 / -- The conventional glass antenna equipment for car telephones.] -- The glass antenna equipment for car telephones, 3, 9, 11, 52 -- The pattern for radiation, 7

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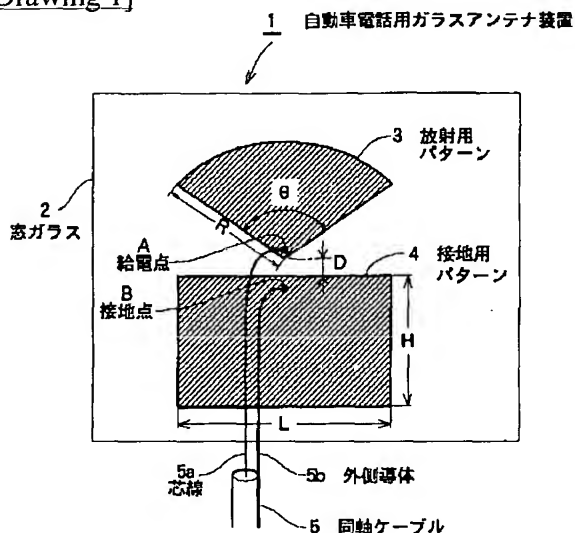
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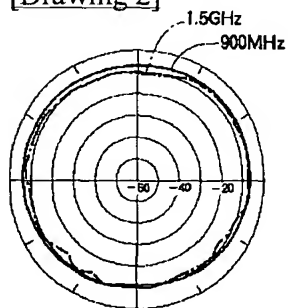
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DRAWINGS

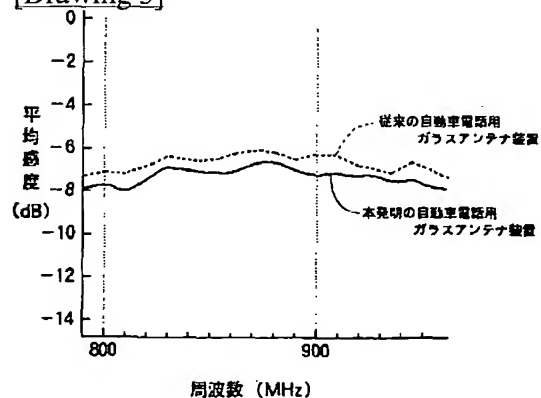
[Drawing 1]



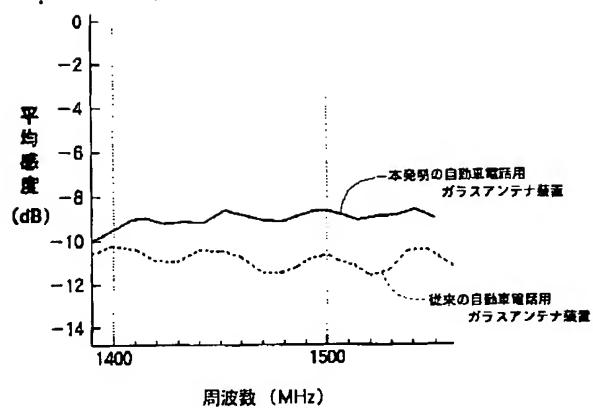
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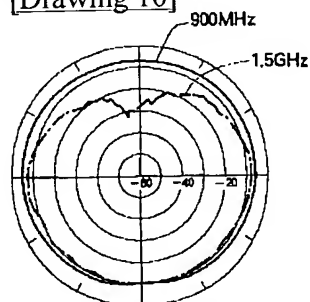
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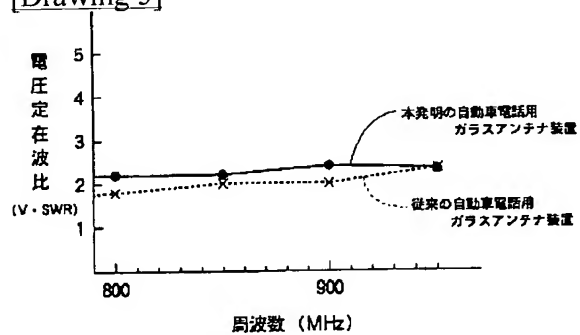
[Drawing 4]



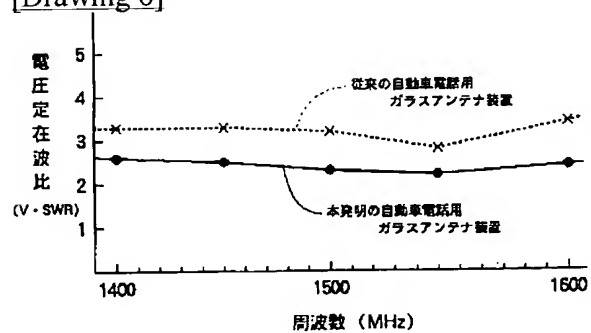
[Drawing 10]



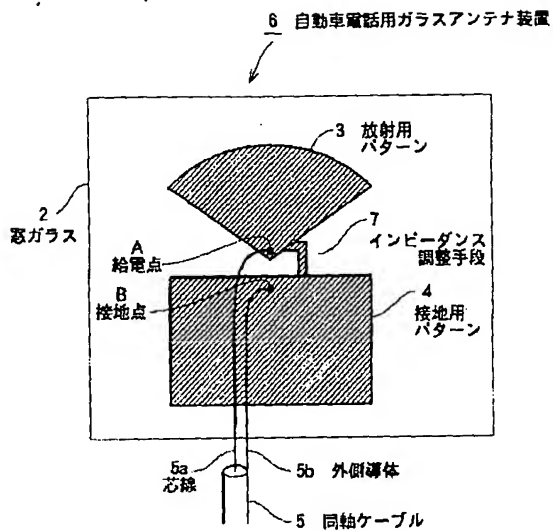
[Drawing 5]



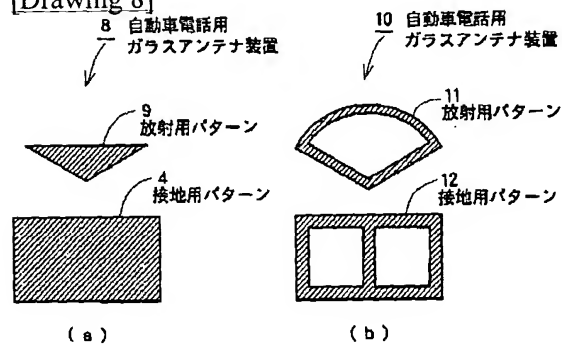
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Drawing 9]

